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A Sport shoe, in particular
a shoe for Long Distance Running
on Hard Tracks

Claims

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(18) The following documents were referred to
to determine patentability—

DE-PS	470377
DE-OS	2650034
DE-GM	1970423
CH	391510
CH	348337
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^{(24) The}
A Sport shoe, in particular
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(27) Summary—none

3. A sport shoe in accord with Claim 1, therein characterized, in that the extension (5) is formed by a separate spring element (6, 15) bound to the outer sole (2).
4. A sport shoe in accord with Claim 1 or 2, therein characterized, in that the extension (5) is stiffened by a spring element (6, 15), which is inserted into the inside of the shoe bottom.
5. A sport shoe in accord with Claim 4, therein characterized, in that the springlike element (6) is plate shaped.

6.

A sport shoe in accord with one of the Claims 1 to 5, therein characterized, in that, in the angle between the extension (5) and the outer side of the upper (7) at the heel, is placed at least one resilient reinforcement element (8), which supports itself on the outside of the upper (7) and on the top side of the extension (5) when under stress and with the therefrom generated deformation of the extension (5).

A sport shoe in accord with Claim 6, therein characterized, in that a plurality of rib shaped, elastic support elements (8) are fastened on the outer side of the upper and/or on the top side of the extension (5).

A sport shoe in accord with one of the Claims 5 to 7, therein characterized, in that the one or more support elements (8) are of one piece with the plate shaped spring element (6).

A sport shoe in accord with Claim 4, therein characterized, in that the heel wedge (3), on its rear edge, possesses a recess (12), extending to both sides of the line of the heel sides, in which said recess a spring element (15) is placed, that is, clamped

A sport shoe in accord with one of the Claims 3 to 9, therein characterized, in that the spring element (15) is affixed in an exchangeable mode.

A sport shoe in accord with Claim 1 or 2, therein characterized, in that the heel wedge (3) is made of a relatively soft plastic material and the outer sole (2) is constructed of a relatively hard plastic material, and in that the rear edge of the heel wedge (3) is enclosed by a stiffening shell (7) and in that the top side of the extension (5) and the outer sole (2) is stiffened by a plate (6).

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A Sport shoe, in particular a shoe for Long Distance Running on Hard Tracks

Description

The invention concerns a sport shoe, in particular, for use in long distance running on hard tracks, said sport shoe having an impact absorbing outer sole made of an elastic, yielding plastic, which sole possesses an extension protruding to the rear beyond the lower heel edge of the upper.

For some years it has been customary to provide running shoes, and also training shoes for competitive running, with a rounding of the heel, extending into the sole, in order, by this means, to assure a uniform rolling progress for the foot and, as a result thereof, to increase the performance of the runner. This said rounding, has achieved in competitions, which have been performed on plastic tracks, the desired results, especially in the case of short and middle length runs. This is because, in these disciplines, the runner, with the idea of an increase in performance, by extension, sets a foot relatively far forward on the sole surface, so that by the roll off procedure, the heel is not fully burdened. However, experience has demonstrated, that where long distance running is concerned, in which, as a rule, the strength of the runner does not endure over the full distance, so as to be able to keep the heel without a full burden, the said rounding has a deleterious effect, in the extreme case this can result in a strain on the heel. Disadvantageous effects of this kind reveal themselves especially in long distance running, such as marathons, which are conducted over relatively great distances, and on this account have a some stretches leading over customary streets. By means of the hard street paving, in the case of setting the heelis down with the sole rounding, the elasticity of the outer sole is imprecise and the runner suffers shocks in the area of the heel bone, which in turn lead to tiring and to a pronounced loss of strength.

Up to the present time, in the state of the technology, various methods have been proposed for the damping of the so occurring shocks during the run, especially on hard surfaces. Thus, in the case of a known sport shoe, in DE-OS 24 60 034 there has been designed in the sole an air cushion space in the area of the heel, which, is closed by a valve effect. By deformation caused by pressure, this air cushion space is to elastically capture and dampen the occurring impacts and shocks. In the state of the technology, known proposals of solving this problem have been made in this direction, which provide relatively thick outer soles made of very soft, yielding material. Both embodiments have, however, the substantial disadvantage, that they, in order to achieve a sufficient damping, must assure so great a yielding in the sole in the heel area, that thereby the runner acquires a floating feeling and loses the feel for the track which is necessary for the full exploitation of ability.

There are also street shoes known, in which the heel is pivotable about a given axis in the lying in the sole surface and, by means of metallic tension/compression springs, the said heel is elastically supported (US-PS 23 55 654). Apart from the fact, that this mentioned method is beyond discussion, because of the increase in weight for sport shoes caused thereby, the disadvantage is also found here, that a sufficient damping by the said tension/compression springs can only be achieved, if these springs are relatively weak and have a long travel. Then, however, they lead again to the said floating feel, which is disadvantageous for the performance of the runner.

Further, there is known a heel for street shoes which has a peripherally running groove on its side surface, in order to achieve, that as a result of the thereby attained impact damping elasticity, the wear on the edges would be lessened (CH-PS 1 93 905). Again, this formulation would bring no substantial improvement by its being transferred to sport shoes, because this, in order to be effective, requires so great a flexibility of the heel and the heel rim, that the result would be an insecure state and again the floating feeling.

Finally, by the US-PS 29 30 149, is made known a sport shoe of the generic type mentioned in the introductory passages, the outer sole of which has a multitude of parallel ribs, running transverse to the longitudinal axis of the sole:

These ribs protrude at an incline to the rear and are elastically flexible under the impact of the step. The outer sole, which is fastened onto a middle sole, extends itself in common with the middle sole to the rear over the lower heel rim of the upper. Statements in regard to the size of this extension and its importance in regard to its damping properties are as difficult to extract as is information on the composition of the material of this said middle sole.

The invention, on this account, has the purpose of proposing a sport shoe of the generic kind described in the introductory passages, which, by means of substantial damping of occurring shocks and impacts, especially on hard tracks, helps in restraining unhealthy effects on the heel area, and does so without impairing the performance of the runner, and moreover, even bringing about an increase in the runners performance.

In accord with the invention, this purpose will be achieved, in that the extension measures some 1.5 cm and can bend upward upon the imposition of load by the setting down of the heel.

The invention discards totally any provision of a rounding of the outer sole in the area of the heel as well as basing damping measures solely on pressure deformation of damping prevention means in the heel area. Contrary thereto, the invented proposal is to lengthen the sole in the heel area to a point beyond the lower edge of the upper, in other words, to provide an extension in this area. This extension is elastic, due to the chosen materials and upon a hard ground surface, the extension begins immediately to securely absorb the impacts due to the setting down of the heel, because of the resulting bending distortion of the said extension. Because of the elastic deformation, which the extension experiences upon the implantation of the heel, the extension forms temporarily a rounding, which brings about the same result, which was sought after by the previously known heel area rounding as described in the introductory passages. At the same time, there is made available by this sole extension, an increase in the runners performance, insofar as the extension exercises an elastic reaction on the foot of the runner. This elastic reaction is comparable to the "catapult effect" which is to be achieved on a plastic track.

The sport shoe in accord with the invention allows, in this way, an advantageous damping of all occurring jars and impacts as compared with a previously unattained ability to achieve this effect. Because of the placement of the damping in the area of the bendable extension of the sole, material can be employed whereby the said floating feeling does not occur and the track-feel, necessary to the runner, remains perceptible.

It is true that it is made known, for example by DE-GbmS 19 70 423, in particular where shoes for children are concerned, that soles are extended to the rear beyond the lower part of the upper. The lengthening to the rear is, however, for the purpose of granting the shoe in its heel part, an extraordinary stability, so that the ability of small children to stand, who simultaneously are learning to walk, is increased. Because of this, the rubber sole provided is comprised of relatively hard rubber, in order the that sought after increase of ability to stand is assured for the child.

For the design of the sole extension and the control of the catapult effect which arises therefrom, there are a multiplicity of technical possibilities. Thus, for instance in the case of a sport shoe, the bottom of which is comprised of a combined heel wedge and an outer sole, the outer sole, in its full thickness is carried beyond the heel proximal edge of the heel wedge, and forms thus, the said extension. The possibility however, still exists, of creating the extension by a separate spring element, which, in the heel area is fastened between the upper and the outer sole, or, if necessary, between the heel wedge and the outer sole. Further, combining these two measures is also possible, that is, a lengthening of the outer sole itself. This lengthening, incidentally, is additionally reinforced by a spring element, in order, in this way, to lend the extension the necessary springlike elasticity. The spring element can be, for example, a leaf spring of steel, but also can be a plastic with springlike properties, for example, this could be a hardness adjusted polyamide. This must be solidly anchored in the shoe bottom and extend itself advantageously until it is under the heel. In some cases the spring element possesses, in its area lying under the heel, a recess in order to avoid a hardening of the bottom of the shoe in this position.

In combination, or even instead of a spring element of this kind, in the case of an extension made by the lengthening of the sole, also, at least one spring-elastic reinforcement element can be provided, which, upon the stressing and the thereby arising deformation of the extension, supports itself at the outer side of the upper, that is, also on the back side of the shoe, and on the top side of the extension. While the spring element, in the form of a leaf spring, carries out its spring effect by the loading of the occurring bending, the support element acts on the basis of compression springing. For instance, such support elements are fastened in the form of ribs on the outer side of the upper, and/or on the top side of the extension and are composed of rubber or the like.

In another embodiment, the heel wedge can exhibit a rim grooving, which forms a holding means for a springlike support element. Finally, consideration can also be given to providing metallic cock-springs, which hold the extension in the outstretched position. The concept of the invention permits a relatively simple adaption of the spring elasticity necessary for the catapult effect at the individual wish and especially for the weight of a runner. In that case, if a strong catapult effect is desired, and/or the sport shoe is fitted to an especially heavy weight runner, it is possible to provide stiffer spring or support elements. In this matter, it is of advantage to arrange the spring or support elements to be replaceable. Particularly the previously mentioned construction particularly adapts itself to this purpose, in a case where there is provided a recess in the heel proximal edge of the heel wedge. This is so, because in a recess of this kind, spring elements of rubber or the like, of the same dimensioning, although with different spring reactions, may be placed. Embodiment examples of the present invention are explained in greater detail in the following with the aid of the drawing. The drawing shows in:

Fig. 1 a profile view of an invented sport shoe;

Fig. 2, 3 in enlarged scale, a profile view and a top view of the heel area of the sport shoe shown in Fig. 1; and

Fig. 4, 5 in enlarged scale, a profile view and a top view of the heel area of an additional embodiment.

The sport shoe shown in Fig. 1 has an upper 1 and a relatively soft outer sole (2) made of an elastic plastic. Between the insole (not visible here) on the bottom of the upper 1 and at the outer sole 2, a heel wedge 3 is fastened by adhesion. This heel wedge 3 is likewise constructed from a springlike, possibly foamed plastic and serves the purpose of absorbing impacts arising from the track. The outer sole 2 does not end, in relation to the heel, at that place at which a imaginary continuance of the lower part of the upper would be, and as is indicated in Fig. 1 by a dotted line, but rather extends for a distance of some 1.5 cm beyond this location and to the rear, thus forming an extension 5. In proximity to this extension 5, a forward tapering plate 6, about 3 mm thick, and made of, for instance, springy polyamide, is glued or otherwise affixed to the outer sole. The plate 6 extends itself between the outer sole 2 and the heel wedge 3 into the bottom of the shoe, advantageously, to a width which corresponds to the entire heel area of the outer sole 2. This is done for the purpose of bringing about a good holding power. For the avoidance of a stiffening of the shoe bottom 2, 3 in the area of the heel, the plate 6, possesses locally, a recess (not shown) under the position where the heel of the runner is placed.

The heel end rim of the heel wedge 3 is reinforced with a shell 7 of polyamide or the like, which serves as a base and wear resistant surface for three rib shaped support elements 8 which are triangular in cross-section. These support elements 8 consist of rubber or the like and are affixed to the top side of the plate 6, that is, they are fastened thereon with adhesive. In a load free position of the extension 5, the said support elements 8 show a very small separating distance between their support surface and the shell 7. As may be inferred from Fig. 3, the three rib shaped support elements 8 radiate to the rear and form a springy elastic stiffening for the extension 5 and the plate 6 fastened thereon.

The upper 1 can include a stiffening heel cap 10, which bolsters the support action of the shell 7.

In the embodiment in accord with Figs. 4, 5, the heel wedge 3 possesses on its rear side, a recess 12, which runs in a weak bow-shape and in cross-section is somewhat semicircular.

For this purpose, the heel end of the heel wedge is somewhat less in curvature, than is normally the practice (see Fig. 5 in comparison to Fig. 3). Above the recess 12, and between the bottom of the upper 1 (this being the insole) and the heel wedge 3, a molded part 14 of polyamide is fastened, which extends itself over at least a part of the length of the recess 12 and projects to the rear. This shell shaped molded piece 14 serves for the retaining of a spring element 15 which is clamped into the recess 12. The said spring element is usually made of a round twining of rubber. By means of appropriate roughing of the recess 12, the underside of said molded piece 14, and the outside of the spring element 15 are properly seated in a good holding and clamping situation. The spring element 15 is exchangeably placed in the recess 12. The exchange of said spring element is carried out in such a manner, that the extension 5 is bent downward, so that it releases the said spring element, whereupon this can be withdrawn.

In the course of the use of the sport shoe shown in the drawing, when the heel is set upon the track, the extension 5 experiences a deformation upward. This is opposed by the extension 5 because (a) of the inherent elasticity of the outer sole, (b) the upward bend is resisted by the plate 6 which has opposite bending properties, and (c) due to compression, the bend is contrary to the bending nature of the support elements 8 or 15.

The extension 5, on this account, forms a temporary rounding, the amount of being dependent upon the spring rigidity of the involved components, so that a satisfactory roll of the foot becomes possible. Because of this roll procedure, as soon as the full foot loading departs in forward movement from the extension 5, then the extension 5, due to its inherent elasticity, is pressed back into its original position, whereby the athlete – again dependent on the strength of the spring elasticity – experiences a lifting force, i.e., a catapult effect.

It is obvious, that the chosen form of the extension 5, as shown in the illustrated embodiments, approaches the shape of a rectangle, when seen from above, is not necessarily exclusive. Much more, it is also possible to allow the extension 5 to let its rear edge run at a uniform distance from the lower rim of the upper.

In any case, the concept of the invention is to be seen, in that the extension of the outer sole, upon the setting down of the heel end, bends elastically upward, and thereby effects a catapulting action.

This can also be attained, for example, if the heel wedge is constructed throughout of a relative soft springlike material, in contrast to the previously employed materials,

while the outer sole 2 is made of a somewhat stiffer material. In order to prevent that an undesirable floating feeling is engendered by the use of the sport shoes, it is sufficient to make provision for the heel area shell 7 and the plate 6, whereby the latter extends itself under the ankle of the sport shoe. The serrate ribs 18 or their presence on the underside of the shell 7, prevent, that by a breakdown of the support elements 8, because of fatigue, the runner experiences an jolt, due to the collision of the plate 6 and the edge of the shell 7. The serrate ribs 18, moreover, can themselves carry out a spring function.

Finally, it is not a requirement, that a provided stiffening means on the top side of the extension 5, for instance, the plate 6, need be surface connected (i.e., adhesively fixed) to the extension 5. In many cases, it can prove advantageous if the stiffening only covers the extension.

